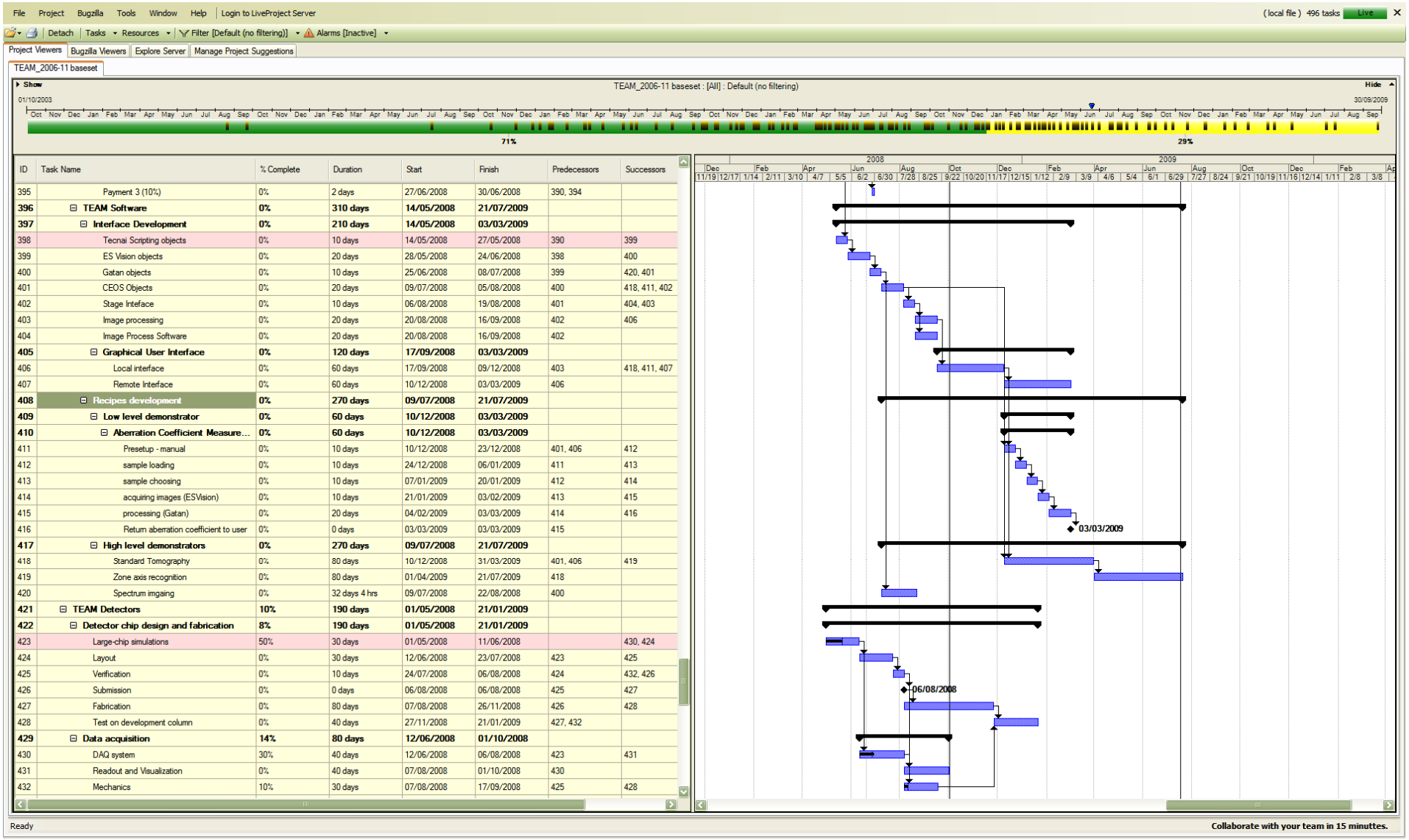
TEAM Software

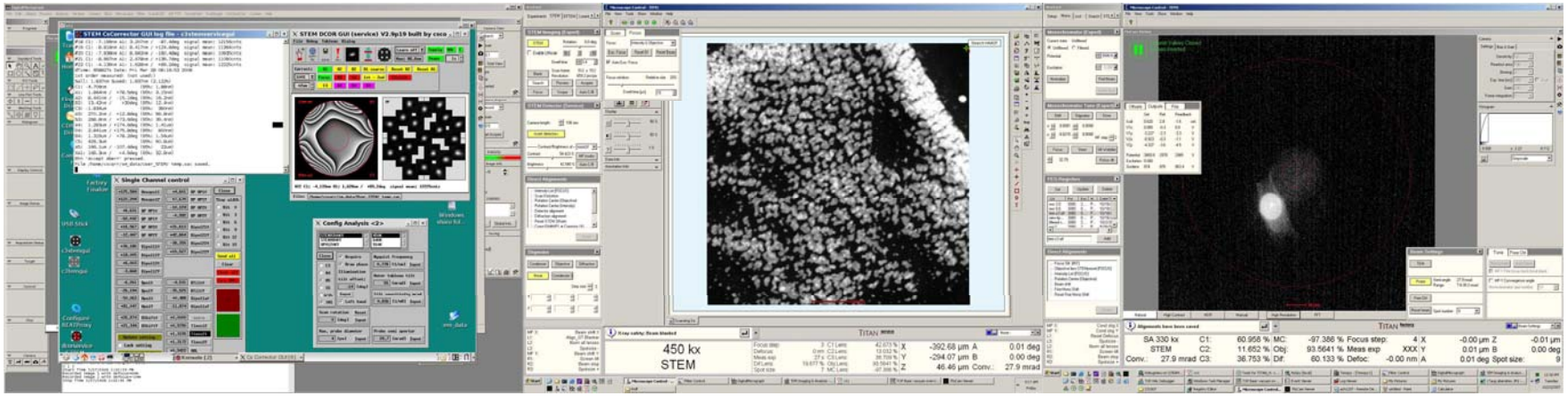
Quentin Ramasse – microscopy – software integration

Earl Cornell – software engineering

TEAM Software



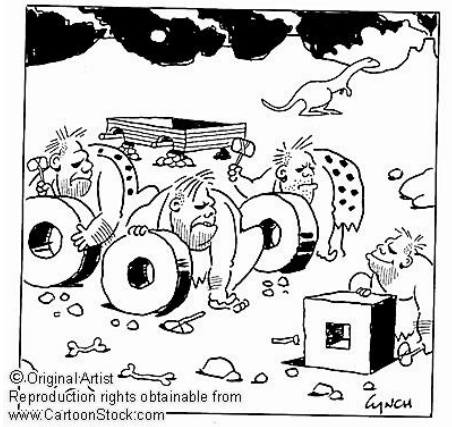
Multiple interfaces

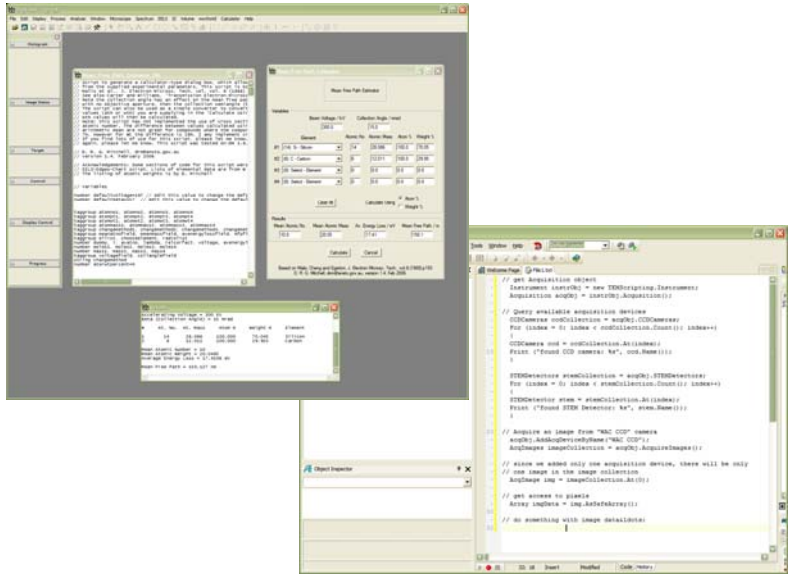


- Manufacturers' interfaces:
  - FEI (ES Vision, TEM Server): microscope
  - CEOS: aberration control
  - Digital Micrograph: spectroscopy, cameras
- "Home grown" interfaces:
  - Stage
  - Detectors
  - Analysis…

Unified scripting layer

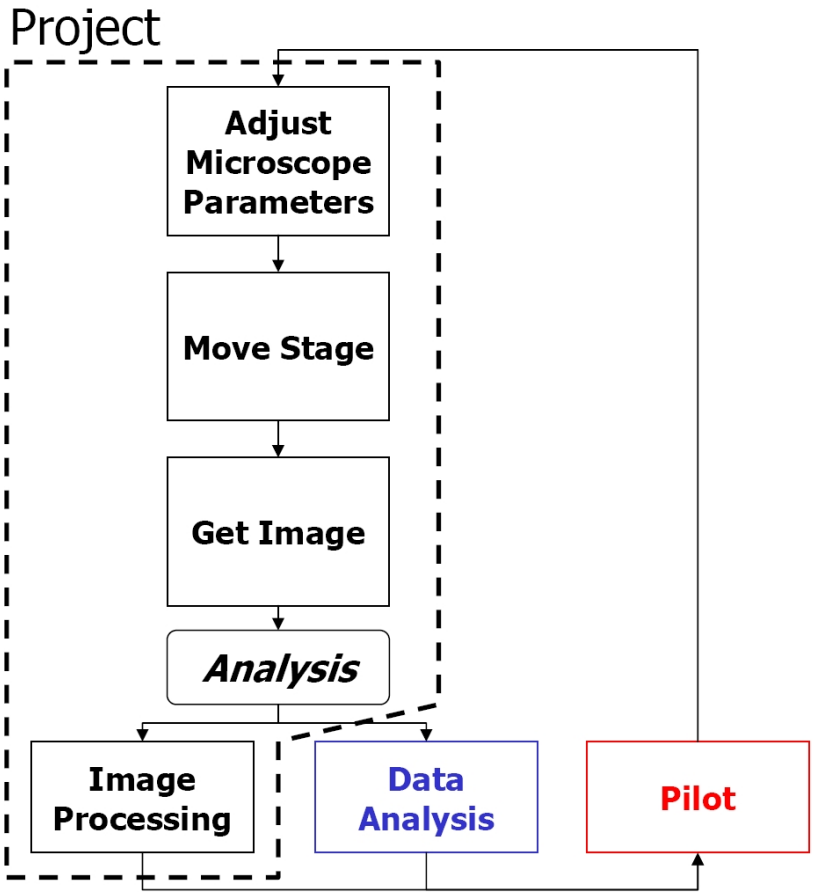
- Existing interfaces are the fruit of years of development: let's not re-invent the wheel!
- Scripting solution:
  - Reprise existing scripting capabilities
  - Easily maintained
  - Easily extended
  - Unified platform for all TEAM partners
  - Ideal for remote control
- Pitfalls:
  - Scripting can be esoteric for non-programming savvy users: additional "simplified" functions
  - Command-line is off-putting: basic GUI





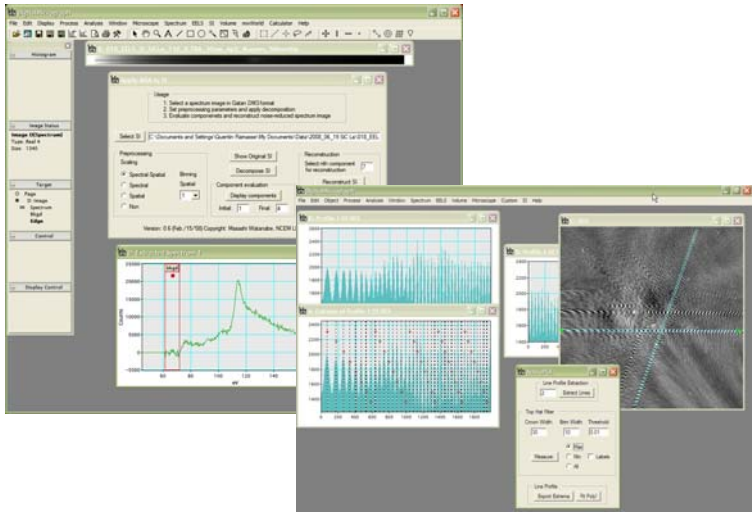
Recipes

- Re-define a number of functions:
  - Recipes for common cross-platform procedures (acquire image, change format, analyse)
- Automation for complex, repetitive actions (with a view to facilitate lengthy experiments – tomography)
- Long-term: high level scripting functions for ease of use (by-pass programming nitty-gritty)

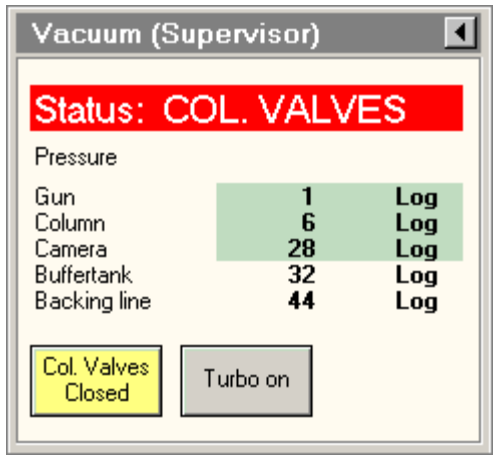


Modular integration

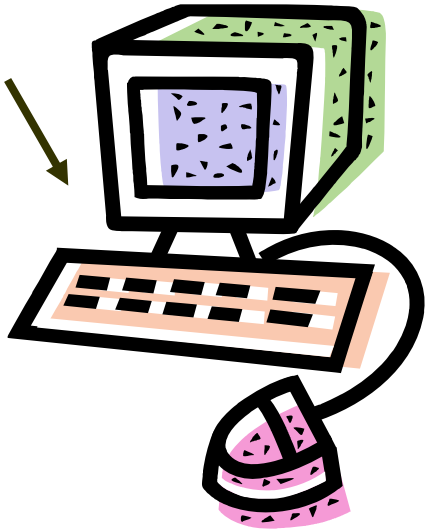
- Initial capabilities (“deliverables”):
  - Standard tomography: C. Kisielowski, M. Rossel
  - Zone-axis recognition: T. Duden, C. Kisielowski
  - Spectroscopy (basic): M. Watanabe
- Integrate additional “modules” as they are being developed (“research”):
  - Advanced stage: T. Duden
  - In-situ stage: UIUC
  - Atomic resolution tomography: C. Kisielowski, M. Rossel
  - Spectroscopy: M. Watanabe
  - Aberration control: Q. Ramasse, A. Lupini
- Third party (e.g. MacTempas)



Remote TEAM




```
IlluminationPtr  MyIllumination;
VectorPtr        MyShift;
double           MyShiftX;
MyIllumination = MyInstrument->Illumination;
MyShift        = MyIllumination->Shift;
MyShiftX       = MyShift->X;
```



Instrument → **Control Code** → **GUI Code** → **Human Interface Device (HID)**

Remote TEAM

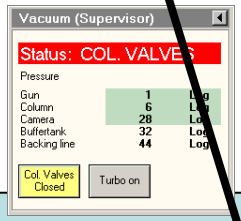
Remote Desktop

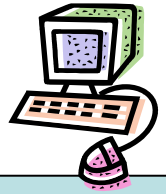
Virtual Network Computing

Via FEI Control Panel Interface

- Joy Stick
- Track ball
- Touch Screen
- Etc.

```
IlluminationPtr  MyIllumination;
VectorPtr        MyShift;
double           MyShiftX;
MyIllumination = MyInstrument->Illumination;
MyShift        = MyIllumination->Shift;
MyShiftX       = MyShift->X;
```





Instrument → **Control Code** → **GUI Code** → **Human Interface Device (HID)**

Remote TEAM

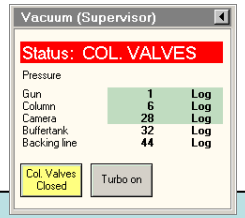
Multi-Client Network Interface for “Objects”

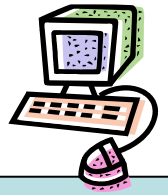
- COM interface to microscope
- CEOS
- Gatan Scripts / GIF
- Stage
- etc.

Network →

New Remote GUI

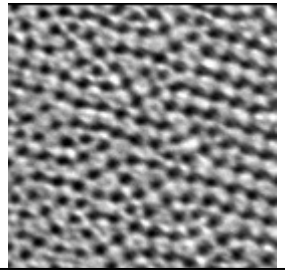
```
IlluminationPtr  MyIllumination;
VectorPtr        MyShift;
double           MyShiftX;
MyIllumination = MyInstrument->Illumination;
MyShift        = MyIllumination->Shift;
MyShiftX       = MyShift->X;
```





Instrument → **Control Code** → **GUI Code** → **Human Interface Device (HID)**

Automation/Scripting



Get Image

Analyze Image

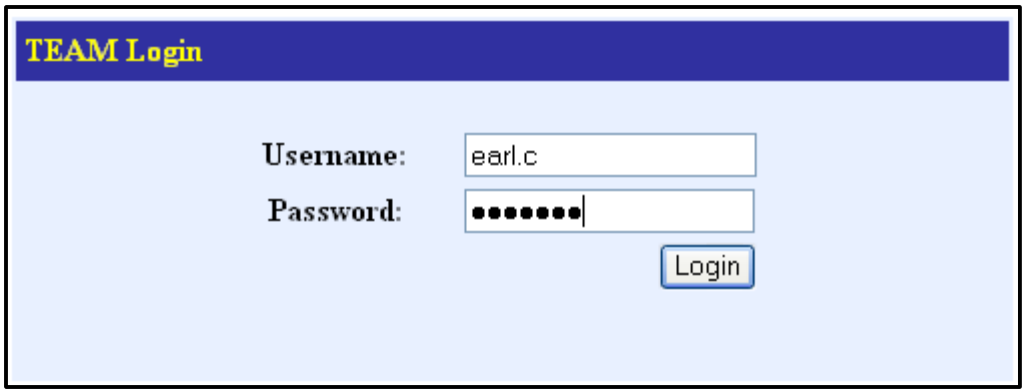
Adjust Instrument and / or Sample

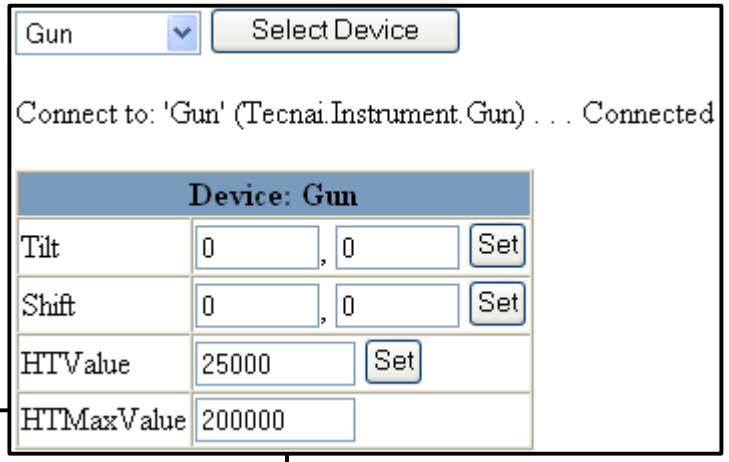
Iterate as needed

To make this flexible the scripting language needs access to:

- Instrument control (R/W)
  - Gun
  - Illumination
  - Projection
  - Correctors
  - Etc.
- Image Acquisition
  - GIF
  - TIA
  - Etc.
- Analysis Software
  - Digital Micrograph
  - Mac Tempas
  - Etc.

Web interface (PHP)



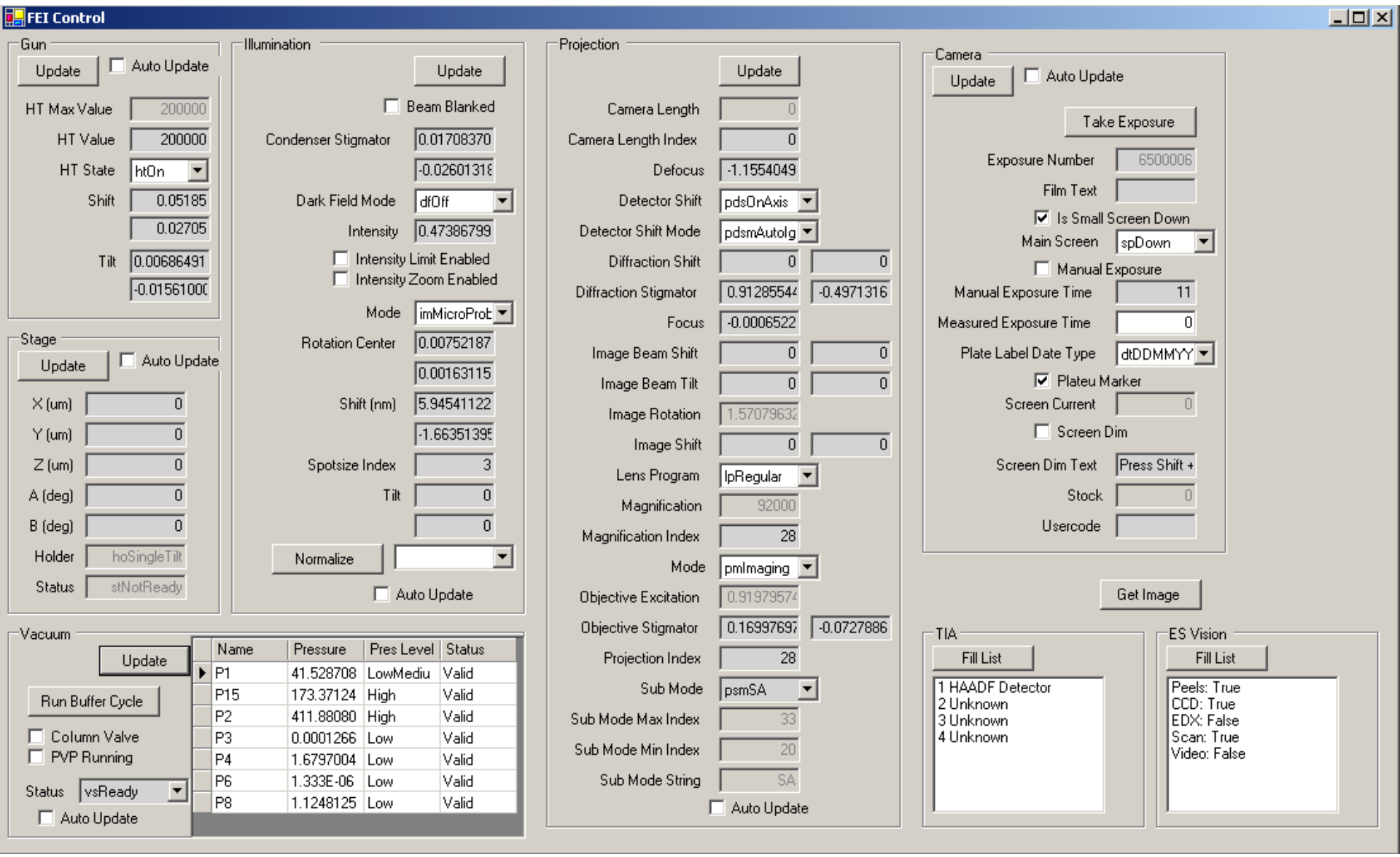


Gun | Select Device

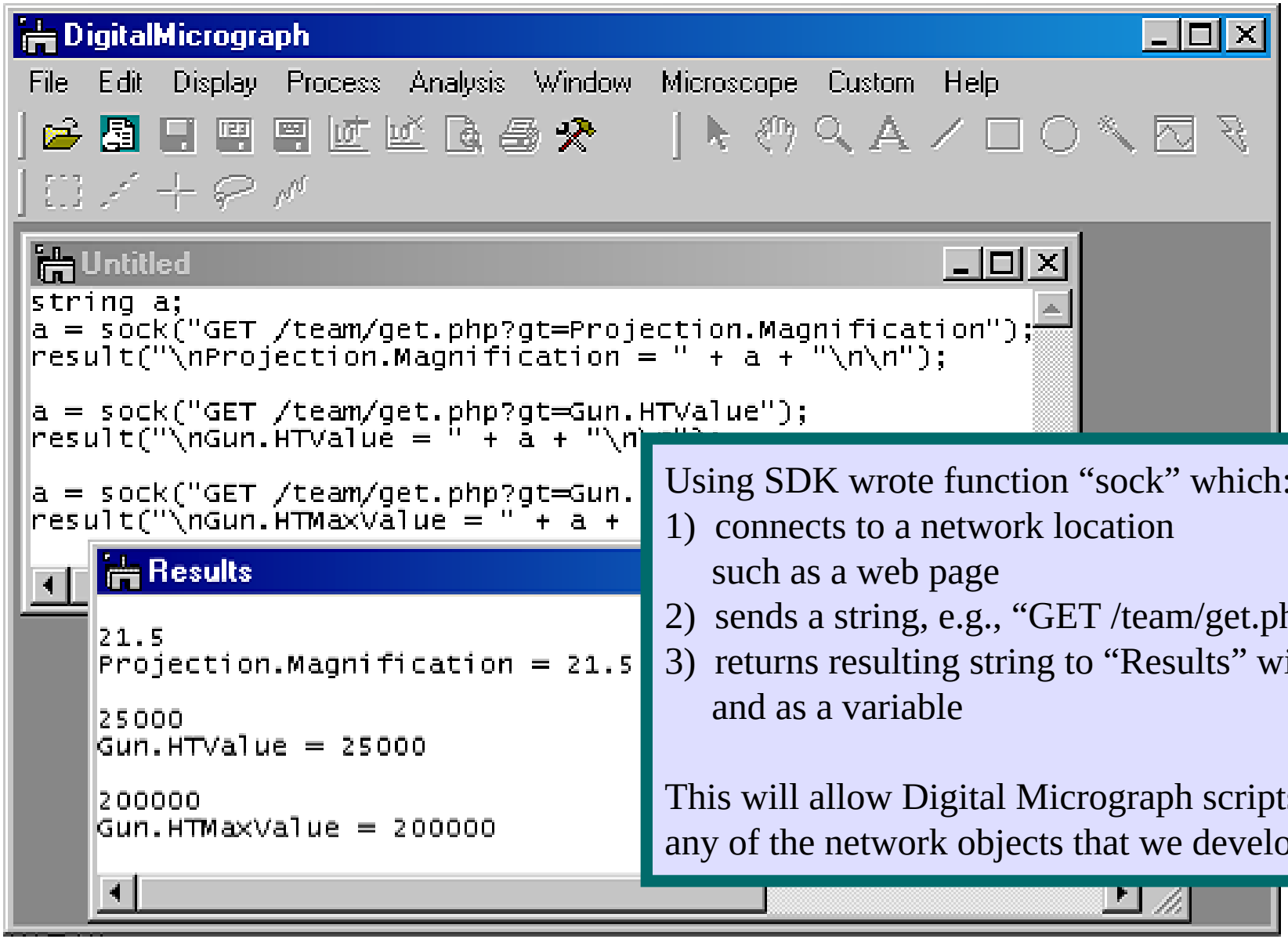
Functions for Gun

ID	Variable	Setable	Units	Type	Description	Add
2	Tilt	Yes	-1.0 to +1.0 (logical units)	Vector	The gun tilt alignment values. Range from -1.0 to +1.0 in x and y directions (logical units). The beamblanker changes the gun tilt. Therefore changing the gun tilt alignment is blocked as long as the beamblanker is active.	
3	Shift	Yes	-1.0 to +1.0 (logical units)	Vector	The gunshift alignment values. Range from -1.0 to +1.0 in x and y directions (logical units).	
1	HTValue	Yes	Volts	Double	Set / Get High Tension value for Gun	
5	HTMaxValue	No	Volts	Double	The maximum possible value of the HT on this microscope.	

Visual Studio interface



Gatan Script access to network “objects”



Using SDK wrote function “sock” which:

1) connects to a network location such as a web page
2) sends a string, e.g., “GET /team/get.php”
3) returns resulting string to “Results” window and as a variable

This will allow Digital Micrograph scripts to use any of the network objects that we develop.